

What is claimed is:

1. A liquid crystal display device, comprising:
a pair of substrates disposed to be opposite to each other;
a liquid crystal sealed between the pair of substrates
and aligned almost vertically to the substrate when a voltage
is not applied;

a pair of quarter-wave plates respectively disposed at
outer sides of the pair of substrates;

a pair of polarizing plates respectively disposed at outer
sides of the pair of quarter-wave plates; and

a pixel area including a reflection area provided with
a reflecting plate having a reflecting surface and for reflecting
light incident from one of the pair of substrates, and a
transmission area for causing light incident from the other
of the pair of substrates to be transmitted toward the one of
the pair of substrates.

2. A liquid crystal display device according to claim
1, further comprising an optical scattering layer disposed at
an outer side of the one of the pair of substrates.

3. A liquid crystal display device according to claim
2, wherein the optical scattering layer scatters only light
incident at an incident angle in a specified range.

4. A liquid crystal display device according to claim
1, wherein the reflecting plate is formed of a same formation

material as an electrode of a thin film transistor formed in the pixel area.

5. A liquid crystal display device according to claim 1, wherein the reflecting plate is one electrode of a storage capacitor or source/drain formed in the pixel area.

6. A liquid crystal display device according to claim 1, wherein the reflecting plate is disposed to overlap with a pixel electrode formed in the pixel area when viewed in a direction vertical to a substrate surface.

7. A liquid crystal display device according to claim 6, wherein the reflecting plate is electrically connected to the pixel electrode.

8. A liquid crystal display device according to claim 6, wherein the reflecting plate is electrically separated from the pixel electrode.

9. A liquid crystal display device according to claim 1, wherein the reflecting plate is disposed not to overlap with a pixel electrode formed in the pixel area when viewed in a direction vertical to a substrate surface.

10. A liquid crystal display device according to claim 1, wherein at least a part of the reflecting surface is formed of aluminum.

11. A liquid crystal display device according to claim 10, wherein the reflecting plate includes a conductive layer made of a material other than aluminum, and an aluminum layer which is formed as an under layer of the conductive layer and whose surface is exposed in an area where the conductive and/or the insulating layer is removed.

12. A liquid crystal display device according to claim 11, wherein a transparent electrode is formed to cover the aluminum layer.

13. A liquid crystal display device according to claim 11, wherein the conductive layer is a titanium layer.

14. A method of manufacturing a liquid crystal display device, comprising the steps of:

forming an aluminum layer and a conductive layer made of a material other than aluminum in this order;

patterning the conductive layer and the aluminum layer;

forming an insulating layer on the patterned conductive layer; and

removing the insulating layer on the conductive layer to form an opening part, removing the conductive layer exposed through the opening part to expose the aluminum layer, and forming a reflecting surface of a reflecting plate.

15. A method of manufacturing a liquid crystal display

device according to claim 14, further comprising a step of forming a transparent electrode covering the aluminum layer.

16. A liquid crystal display device comprising:
a pair of substrates disposed to be opposite to each other;
a liquid crystal sealed between the pair of substrates and having a negative dielectric anisotropy;
a pixel electrode formed in each of pixel areas of one of the pair of substrates;
an alignment controlling structure which is disposed on at least one of the pair of substrates and whose plane shape includes a straight line; and
a reflecting film selectively formed on the alignment controlling structure including an inclined surface of the alignment controlling structure.

17. A liquid crystal display device according to claim 16, wherein the alignment controlling structure is a protrusion.

18. A liquid crystal display device according to claim 17, wherein the alignment controlling structure is a hollow.

19. A liquid crystal display device according to claim 18, further comprising a second alignment controlling structure disposed to be opposite to the hollow through the liquid crystal.

20. A liquid crystal display device according to claim 16, an average inclined angle of the inclined surface is

approximately not less than 0° and less than 20° .

21. A liquid crystal display device according to claim 16, further comprising a third alignment controlling structure formed in a gap portion of the adjacent alignment controlling structures.

22. A liquid crystal display device according to claim 16, further comprising a slit in which a part of the reflecting film is removed.

23. A liquid crystal display device comprising:
a pair of substrates disposed to be opposite to each other;
a liquid crystal sealed between the pair of substrates and having a negative dielectric anisotropy;
a pixel electrode formed in each of pixel areas of one of the pair of substrates;
an alignment controlling structure which is disposed on at least one of the pair of substrates and whose plane shape includes a straight line; and
a reflecting film selectively formed as an under layer of the alignment controlling structure.

24. A liquid crystal display device according to claim 23, wherein the alignment controlling structure is a protrusion.

25. A liquid crystal display device according to claim 24, wherein the protrusion has a convex sectional shape and

is formed of a transparent material having a refractive index larger than the liquid crystal.

26. A liquid crystal display device according to any one of claims 16 to 25, wherein the alignment controlling structure extends almost in parallel with, almost vertically to or at an angle of approximately 45° with respect to an end side of the pixel electrode.

27. A liquid crystal display device according to claim 16, wherein the reflecting film is electrically separated from the pixel electrode.

28. A liquid crystal display device according to claim 16, wherein the reflecting film is electrically connected to the pixel electrode.

29. A liquid crystal display device comprising:

a first substrate including a plurality of gate bus lines disposed almost in parallel with each other, a plurality of drain bus lines disposed almost in parallel with each other to intersect with the gate bus lines, a plurality of switching elements respectively provided at intersection parts of the gate bus lines and the drain bus lines, and a plurality of pixel electrodes formed and connected to the plurality of switching elements, respectively;

a second substrate provided to be opposite to the first substrate and having an opposite electrode opposite to the

plurality of pixel electrodes; and

a liquid crystal layer sealed between the first substrate and the second substrate and having a negative dielectric anisotropy,

wherein each of the pixel electrodes includes a plurality of electrode units disposed through a slit and electrically connected to each other, and

each of the electrode units includes a solid part and a plurality of extension parts extending from the solid part toward an outer peripheral direction of the electrode unit.

30. A liquid crystal display device according to claim 29, wherein the plurality of electrode unit are formed of a same conductive film.

31. A liquid crystal display device according to claim 29, wherein a ratio of a square measure of the solid part to a square measure of an area within an outer periphery of the electrode unit is 50% or more.

32. A liquid crystal display device according to claim 29, wherein at least part of the plurality of extension parts are almost parallel to each other.

33. A liquid crystal display device according to claim 29, wherein the plurality of extension parts extend radially from a starting point of a center part of the electrode unit to an outer periphery of the electrode unit.

34. A liquid crystal display device according to claim 29, wherein an extension direction of the extension part has an angle of 0 to 90° with respect to one side of an outer periphery of the electrode unit.

35. A liquid crystal display device according to claim 29, wherein the solid part is positioned almost at a center of the electrode unit.

36. A liquid crystal display device according to claim 35, wherein a shape of the solid part is a convex polygon.

37. A liquid crystal display device according to claim 36, wherein

the electrode unit includes a convex polygonal outer periphery, and

the solid part includes a side almost parallel to a side of the outer periphery of the electrode unit.

38. A liquid crystal display device according to claim 29, wherein

the solid part is continuously formed between two opposite sides of an outer periphery of the electrode unit, and

the plurality of extension parts are formed in an area at a side of an outer periphery of the electrode unit where the solid part is not formed.

39. A liquid crystal display device according to claim 38, wherein a facing direction of the two opposite sides is almost parallel to the gate bus lines or the drain bus lines.

40. A liquid crystal display device according to claim 29, wherein

the plurality of extension parts are formed in area at one side of an outer periphery of the electrode unit, and

the solid part is formed in an area where the plurality of extension parts of the electrode unit are not formed.

41. A liquid crystal display device according to claim 40, wherein the plurality of extension parts are formed in an area at a side of an outer periphery of the electrode unit opposite to the gate bus lines or the drain bus lines.

42. A liquid crystal display device according to claim 29, wherein four areas are defined in the electrode unit, the plurality of extension parts are formed in at least one of the four areas, and the solid part is formed in the other areas.

43. A liquid crystal display device according to claim 42, wherein the plurality of extension parts are formed in one pair of areas positioned diagonally among the four areas, and the solid part is formed in the other pair of areas positioned diagonally.

44. A liquid crystal display device according to claim

29, wherein in the electrode unit, four areas are defined by diagonal lines of an outer periphery of the electrode unit, the plurality of extension parts are disposed in at least one of the four areas, and the solid part is formed in the other areas.

45. A liquid crystal display device according to claim 44, wherein the plurality of extension parts are formed in one pair of areas positioned diagonally among the four areas, the solid part is formed in the other pair of areas positioned diagonally, and the one pair of areas are areas including a side of the outer periphery of the electrode unit at a side of the drain bus line.

46. A liquid crystal display device according to claim 29, wherein the extension parts are formed in an area extending inward from an outer periphery of the electrode unit by 5 μm or more.

47. A liquid crystal display device comprising:
a first substrate including a plurality of gate bus lines disposed almost in parallel with each other, a plurality of drain bus lines disposed almost in parallel with each other to intersect with the gate bus lines, a plurality of switching elements respectively provided at intersection parts of the gate bus lines and the drain bus lines, and a plurality of pixel electrodes respectively formed and connected to the plurality of switching elements, respectively;

a second substrate provided to be opposite to the first substrate and having an opposite electrode opposite to the plurality of pixel electrodes; and

a liquid crystal layer sealed between the first substrate and the second substrate and having a negative dielectric anisotropy,

wherein each of the pixel electrodes includes a plurality of electrode units disposed through a slit, including solid parts, and electrically connected to each other, and

the first substrate further includes reflecting layer formed under areas where the solid parts of all of or part of the plurality of electrode units are formed.

48. A liquid crystal display device according to claim 47, wherein each of the electrode units includes a plurality of extension parts extending from the solid part toward an outer peripheral direction of the electrode unit.

49. A liquid crystal display device according to claim 47, wherein the reflecting layer has a shape almost equal to or smaller than the solid part of the electrode unit formed thereon.

50. A liquid crystal display device according to claim 47, wherein

a ratio of a transmission area where the reflecting layer is not formed in the pixel area is in a range of 50 to 90% with respect to an opening part of a light shielding layer covering

an end part of the pixel area, and

a ratio of a reflection area where the reflecting electrode is formed in the pixel area is in a range of 10 to 25% with respect to the opening part of the light shielding layer.

51. A liquid crystal display device according to claim 47, wherein one electrode unit of the plurality of electrode units is electrically connected to a source electrode of the thin film transistor through the reflecting layer formed under the solid part.

52. A liquid crystal display device according to claim 51, wherein the reflecting layer formed under the solid part of the one electrode unit and the source electrode of the thin film transistor are integrally formed.

53. A liquid crystal display device according to claim 47, further comprising a storage capacitor bus line disposed almost in parallel with the gate bus line and a storage capacitor electrode formed on the storage capacitor bus line through an insulating film,

wherein the reflecting electrode is formed under the solid part of the electrode unit formed on the storage capacitor electrode.

54. A liquid crystal display device comprising:

a first substrate including a plurality of gate bus lines disposed almost in parallel with each other, a plurality of

drain bus lines disposed almost in parallel with each other to intersect with the gate bus lines, a plurality of switching elements respectively provided at intersection parts of the gate bus lines and the drain bus lines, a plurality of pixel electrodes formed and connected to the plurality of switching elements, respectively, and reflecting electrodes partially formed under areas where the plurality of pixel electrodes are formed;

a second substrate provided to be opposite to the first substrate and having an opposite electrode opposite to the plurality of pixel electrodes; and

a liquid crystal layer sealed between the first substrate and the second substrate and having a negative dielectric anisotropy,

wherein in reflection areas where the reflecting layers are formed, a thickness of the liquid crystal layer is thinner than that in other areas.

55. A liquid crystal display device according to claim 54, wherein

each of the pixel electrodes includes a plurality of electrode units disposed through a slit, including solid parts, and electrically connected to each other, and

the reflecting layers are formed through an insulating film under areas where the solid parts of all of or part of the plurality of electrode units are formed.

56. A liquid crystal display device according to claim

54, further comprising structures formed on a surface of the second substrate opposite to the first substrate and in areas above the reflecting layers,

wherein in reflection areas where the reflecting layers are formed, a thickness of the liquid crystal layer is thinner than that in other areas by the structures.

57. A liquid crystal display device according to claim 56, wherein the structures are formed on the opposite electrode.

58. A liquid crystal display device according to claim 56, further comprising protrusions formed on the structures.

59. A liquid crystal display device according to claim 54, further comprising a structure which is formed on the first substrate and on an upper surface and a side surface of which the reflecting electrode is formed,

wherein in a reflection area where the reflecting layer is formed, a thickness of the liquid crystal layer is thinner than that in another area by the structure.

60. A liquid crystal display device comprising:

a first substrate including a plurality of gate bus lines disposed almost in parallel with each other, a plurality of drain bus lines disposed almost in parallel with each other to intersect with the gate bus lines, a plurality of switching elements respectively provided at intersection parts of the gate bus lines and the drain bus lines, and a plurality of pixel

electrodes formed and connected to the plurality of switching elements, respectively;

a second substrate provided to be opposite to the first substrate and having an opposite electrode opposite to the plurality of pixel electrodes; and

a liquid crystal layer sealed between the first substrate and the second substrate and having a negative dielectric anisotropy,

wherein each of the pixel electrodes includes a plurality of electrode units disposed through a slit, including solid parts, and electrically connected to each other, and

the first substrate further includes a reflecting layer formed under an area where the electrode unit of each of the pixel areas is not formed.

61. A liquid crystal display device according to claim 60, wherein each of the electrode units includes a plurality of extension parts extending from the solid part toward an outer peripheral direction of the electrode unit.

62. A liquid crystal display device according to claim 60, wherein the reflecting layer is formed under an area where the slit is formed.

63. A liquid crystal display device according to claim 62, wherein the reflecting layer formed in an area where the slit is formed are electrically separated from each other.

64. A liquid crystal display device according to claim 60, wherein

each of the pixel electrodes is formed to have a width narrower than an opening part of a light shielding layer for shading an end part of each of the pixel areas, and

the reflecting layer is formed under an area around the electrode unit.

65. A method of manufacturing a liquid crystal display device in which a liquid crystal layer having a negative dielectric anisotropy is sealed between a pair of substrates, comprising the steps of:

forming a conductive film on a substrate; and

forming a pixel electrode including a plurality of electrode units each including a solid part and a plurality of extension parts extending from the solid part toward an outer peripheral direction by patterning the conductive film.

66. A liquid crystal display device comprising:

a first substrate including a plurality of gate bus lines disposed almost in parallel with each other;

a plurality of drain bus lines disposed almost in parallel with each other to intersect with the gate bus lines;

a plurality of switching elements respectively provided at intersection parts of the gate bus lines and the drain bus lines and a plurality of pixel electrodes respectively formed in pixel areas respectively connected to the plurality of switching elements;

a second substrate provided to be opposite to the first substrate and having an opposite electrode opposite to the plurality of pixel electrodes; and

a liquid crystal layer sealed between the first substrate and the second substrate,

wherein layer for reflecting the incident light is fabricated using the same layer as that for gate layer or drain layer,

a part of gate layer or drain layer is covered by an insulating layer,

a part of the layers for reflecting the incident light is not covered by the insulating layer.

67. A liquid crystal display device according to claim 66,

wherein the part of the layers for reflecting the incident light without insulating layer on it have the surface with aluminum or have the surface where aluminum layer is exposed.

68. A liquid crystal display device according to claim 66,

wherein a part of the layers for reflecting the incident light is covered by a transparent electrode layer.

69. A liquid crystal display device according to claim 66,

wherein layer for reflecting the incident light is fabricated using the same layer as that for drain layer and

a layer fabricated by using the same layer as that for gate layer is put or fabricated beneath the layer for reflecting the incident light.

70. A liquid crystal display device according to claim 66,

wherein the pixel electrodes has a solid part and the layer for reflecting the incident light is fabricated in the solid part.

71. A liquid crystal display device according to claim 68,

wherein the layers for reflecting the incident light have aluminum layer and titanium or molybdenum layer on the surface and are covered by transparent electrode, and the transparent electrode is connected to the layer for reflecting the incident light through titanium or molybdenum layer.

72. A liquid crystal display device according to claim 71,

wherein the layers for reflecting the incident light have the aluminum layer on which titanium or molybdenum layer is fabricated, the holes are fabricated to the insulating layer and titanium or molybdenum layer to let the aluminum layer be exposed, and the transparent electrode is connected electrically to the titanium or molybdenum layer at the edge of the hole.

73. A liquid crystal display device according to claim 66,

wherein at least a part of the layers for reflecting the incident light is fabricated in the area for realizing subsidiary capacitance.